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(54) Method of cleaning drinks dispense systems

(57) A method for cleaning a beverage dispensing system or beer line comprises a two stage process with a preliminary step of treating the system with a solution of conventional alkaline beer line cleaner, in order to remove contaminants and to expose raw biofilm to be treated. This is followed by a secondary treatment with a solution of chlorine dioxide. The chlorine dioxide solution, comprising between 50 and 1000 ppm of available chlorine dioxide, is generated in situ by mixing a solid acid, such as citric acid or isocyanuric acid with a solution of sodium chlorite.

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Description

[0001] The present invention relates to the field of beverage dispense line cleaning. More particularly, but not exclusively, it relates to a method for removal of biofilm and other microscopic contaminants from beer lines.

[0002] In licensed premises, each dispensing tap is usually served by a system of tubing and valves, leading from a keg or other storage vessel kept in a cellar, or equivalent, to the dispensing tap on a bar counter. Such lines are used for many products, both alcoholic and non-alcoholic, but they may be known by the general name of "beer lines".

[0003] It is a perennial problem to keep the beer lines clear of contamination, both for health reasons and to avoid tainting the taste of the beverage. This may take the form of bacterial contamination and/or yeast growth, which can normally be kept at bay with regular use of beer line cleaners, such as those based on mixtures of alkali metal hydroxides and hypochlorites. These both clean and disinfect the beer lines. However, such beer line cleaners are less effective against biofilm.

[0004] Biofilm is a generic term for a layer of contamination which can build up on the interior wall of a beer line. The exact composition can vary, but biofilm generally comprises a matrix of long-chain polysaccharide molecules, which adhere strongly to the wall of the beer line, and can entrap or bond to other contaminants. Bacteria and other biological cells can easily be incorporated into biofilm, anchoring them firmly and, to a great extent, protecting them from the action of conventional beer line cleaners.

[0005] Biofilm is very tenacious and resistant to conventional cleaners and may require steeping in conventional beer line cleaner for many hours to penetrate and break down the film. Any unremoved biofilm not only acts as a source of re-infection of the line, but may also subsequently come free and enter the beverage being dispensed. The particulate thus produced can lead to an unsightly haze in beer or other beverage pulled through the beer line, and can even be large enough to be seen by the naked eye (so-called "floaters").

[0006] There may also be "off flavours" present in the beer line due to phenol, chlorophenol, hydrogen sulphide, diacetyl or DMS given off by the biofilm, and these should be removed before they taint the next passages of beer or other beverage.

[0007] There is hence a need for a rapid, effective and safe method for removing biofilm from beer lines.

[0008] It is therefore an object of the present invention to provide a method for cleaning the interior of beer lines which can rapidly and thoroughly break down and remove biofilm from the beer lines.

[0009] According to the present invention, there is provided a method of cleaning a beverage dispensing system comprising the steps of introducing into the system an alkaline treatment solution, clearing the system and then introducing a second treatment solution containing chlorine dioxide.

[0010] Preferably, the chlorine dioxide treatment solution is generated in situ by mixing an acid with a first precursor solution comprising chlorite ions, such as sodium chlorite.

[0011] Advantageously, the acid may be a solid, such as isocyanuric acid or a salt thereof.

[0012] Alternatively, the acid may be an organic carboxylic acid or a salt thereof.

[0013] The acid may be a di- or tri-carboxylic acid.

[0014] The organic carboxylic acid may be citric acid, preferably as an aqueous solution.

[0015] A solid acid, such as isocyanuric acid, may be provided in tablet form, advantageously corresponding to a predetermined dose thereof.

[0016] Such a tablet may be adapted for admixture with a predetermined quantity of chlorite solution to generate a desired amount of chlorine dioxide.

[0017] The chlorine dioxide is preferably provided as an aqueous treatment solution comprising between 50 and 1000 ppm of available chlorine dioxide.

[0018] Advantageously, the solution of chlorine dioxide comprises between 100 ppm and 500 ppm of available chlorine dioxide.

[0019] Optionally, said solution may comprise between 200 ppm and 500 ppm of available chlorine dioxide.

[0020] The concentration is advantageously in the region of 250 ppm.

[0021] The chlorine dioxide solution may be prepared by mixing pre-measured quantities of a first precursor solution comprising chlorite ions and a second precursor solution comprising an acid.

[0022] Said precursor solutions may each be provided in a respective container as a pre-measured quantity of a solution of a reagent at a predetermined concentration.

[0023] A pair of two such containers may be conjoined as a double sachet, with a first sachet containing the solution comprising chlorite ions and a second sachet containing the acid solution.

[0024] After a predetermined time interval, an initially produced chlorine dioxide solution may be diluted with water to form a treatment solution having a predetermined chlorine dioxide concentration.

[0025] Embodiments of the present invention will now be more particularly described by way of example.

Example 1

[0026] The reagents necessary for the method were provided in a pair of conjoined sachets containing in one sachet 25ml of a solution containing 3.36% by weight sodium chlorite and other oxychlorine species (equivalent to approximately 2% by weight of available chlorine dioxide) and in the other sachet 10ml of a solution containing 50% by weight citric acid. Both sachets were

opened and the contents were mixed in a convenient vessel. After five minutes, the initially colourless mixture became yellow, believed to be due to the formation of chlorine dioxide in solution. The mixture was made up to 2 litres with water, giving a solution containing approximately 250 ppm of available chlorine dioxide.

[0027] Beer lines were first cleaned with a conventional alkaline beer line cleaner, and the lines were flushed with water. The 250 ppm chlorine dioxide solution was then introduced into the beer lines at the cellar end, and was pulled through until it began to arrive at a dispensing tap at a bar end thereof. The solution was left to take effect for between ten and twenty minutes, when the system was flushed with water. The solution removed from the system contained sufficient broken down and suspended biofilm to render it substantially opaque.

Example 2

[0028] A 6g tablet of isocyanuric acid was added to a 0.5 litre aliquot of 1% sodium chlorite solution held in a polythene reagent bottle. The isocyanuric acid was allowed to dissolve and mix for 7 minutes, in order to activate the release of chlorine dioxide into the solution. The initially colourless solution became a straw yellow colour, believed to indicate the presence of molecular chlorine dioxide in solution. This solution (then containing approximately 10,000 ppm free ClO_2) was diluted 40:1 by adding it to 20 litres of water, giving a solution containing approximately 250 ppm ClO_2, to serve as a beer line cleaner. Such a solution has been found to remain potent and effective for at least a week.

[0029] Beer lines were first cleaned with a conventional alkaline beer line cleaner, and the lines were flushed with water. The 250 ppm ClO_2 solution was then introduced into the beer lines at the cellar end, and was pulled through until it began to arrive at a dispensing tap at a bar end thereof. The solution was readily detectable by its colour and by its characteristic odour. This required approximately half of the volume of solution prepared. The solution was left to take effect for approximately ten minutes, and was then removed by being pulled off at the dispensing tap, the remainder of the solution being simultaneously drawn into the beer lines at the cellar end. This was left for a further ten minutes, and the system was then flushed clear with water. The solution initially removed from the system contained sufficient broken down and suspended biofilm to render it substantially opaque.

[0030] The contamination level within a dispense system may be measured by bioluminescence methods, assaying for ATP resulting from bacteria, yeasts and the like. Tap water typically has a level of 60-70 RLU (relative light units). A badly contaminated beer line as described above had an initial contamination level of 6500 RLU, but after only ten minutes treatment with the chlorine dioxide solution, this fell to 303 RLU. In previous tests, using conventional alkaline beer line cleaners, such a reduction in contamination typically required treatment for at least one or two hours.

[0031] It is envisaged that treatment of a system with a chlorine dioxide solution should follow a treatment with a conventional alkaline beer line cleaner. For example, if the contamination in the system is resistant to removal with the conventional alkaline beer line cleaner, the system may be flushed with water then treated with a chlorine dioxide solution to clean and disinfect the system more rapidly.

[0032] Chlorine dioxide solution used on its own acts only as a surface treatment. In order for it to attack and destroy the biofilm, it is therefore necessary in practice for such a treatment to be used following an initial treatment with conventional alkaline cleaner which exposes the biofilm to the chlorine dioxide.

[0033] It is found that a chlorine dioxide solution as described above may be stored for up to a week without significant loss of effectiveness. However, it may be preferable on health and safety grounds to make up the solution only as and when required.

[0034] While many oxychlorine species are known to have oxidising properties and may thus have some disinfectant properties, chlorine dioxide has been found to be particularly effective at attacking and breaking up biofilm such as is formed on the interior walls of beer lines. It is also lethal to any bacteria, yeasts, mould, fungi and other cellular organisms liberated by the break up of the biofilm. No adverse effects on beer lines have been noted, as chlorine dioxide does not appear to react with the materials of construction normally employed.

[0035] The preferred reagents for generating chlorine dioxide are sodium chlorite (also known as sodium chlorate (III)) and citric acid, which react together to give chlorous acid, $HC\ell O_2$. Chlorous acid may equally conveniently be generated from sodium chlorite and isocyanuric acid, $H_3C_3O_3N_3$. Isocyanuric acid is conveniently available in solid form, such as in tablet form, which renders accurate dosage measurement easy.

[0036] Chlorous acid is not stable in acid solution and slowly decomposes to give chlorine dioxide, as follows:-

$$4HC\ell O_2 \rightarrow 2C\ell O_2 + HC\ell + HC\ell O_3 + H_2O$$

[0037] A solution containing 3.36% by weight sodium chlorite may contain potentially up to 2% by weight ClO_2, but practically produces only approximately 1% by weight of available chlorine dioxide.

[0038] The method described above provides a fast, effective and safe means to remove biofilm from a beverage dispensing system. It is particularly convenient to use and represents at least an order of magnitude improvement in effectiveness and rapidity over existing methods and cleaning agents.

Claims

1. A method of cleaning a beverage dispensing system comprising the steps of introducing into the system an alkaline treatment solution, clearing the system and then introducing a second treatment solution containing chlorine dioxide.

2. A method as claimed in claim 1, wherein the chlorine dioxide treatment solution is generated in situ by mixing an acid with a first precursor solution comprising chlorite ions, such as sodium chlorite.

3. A method as claimed in claim 2, wherein the acid is a solid, such as isocyanuric acid or a salt thereof.

4. A method as claimed in claim 2, wherein the acid is an organic carboxylic acid or a salt thereof.

5. A method as claimed in claim 4, wherein the organic carboxylic acid is citric acid, preferably as an aqueous solution.

6. A method as claimed in any one of the preceding claims, wherein the chlorine dioxide is provided as an aqueous treatment solution comprising between 50 and 1000 ppm of available chlorine dioxide, advantageously in the region of 250 ppm.

7. A method as claimed in any one of the preceding claims, wherein the chlorine dioxide solution is prepared by mixing pre-measured quantities of a first precursor solution comprising chlorite ions and a second precursor solution comprising an acid.

8. A method as claimed in claim 7, wherein said precursor solutions are each provided in a respective container as a pre-measured quantity of a solution of a reagent at a predetermined concentration, and wherein a pair of two such containers is conjoined as a double sachet, with a first sachet containing the solution comprising chlorite ions and a second sachet containing the acid solution.

9. A method as claimed in any one of claims 2 to 8, wherein, after a predetermined time interval, an initially produced chlorine dioxide solution is diluted with water to form a treatment solution having a predetermined chlorine dioxide concentration.

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EUROPEAN SEARCH REPORT

Application Number
EP 02 25 0735

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	US 6 019 117 A (DETSCH STEVEN G ET AL) 1 February 2000 (2000-02-01) * abstract * * column 2, line 22 - line 64 * * column 3, line 10 - line 18 *	1-9	B08B9/027B67D1/07
Y	DE 36 35 357 A (WELLHOENER VEIT) 21 April 1988 (1988-04-21) * abstract; claim 1 * * column 2, line 65 - column 3, line 24 *	1-9	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B08B
C11D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 November 2003	Plontz, N

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82